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(Un)Making the Boundaries of Environmental Law Scholarship: Interdisciplinarity Beyond the Social Sciences?

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1 Introduction: Interdisciplinarity and Environmental Law Scholarship

Despite its recent origins, public international law has developed at great speed to solve and react to current environmental crises. Academics interested in the subject have had little time to reflect on the identity and boundaries of the subject. As Fisher et al. argue,[1] it is time for environmental law academics to pause and begin an internal reflection on their academic subject. This call has been taken up by some scholars, who have discussed the (lack of) coherence of environmental law scholarship[2] and the challenges arising from its perceived interdisciplinarity.[3]

This chapter contributes to these existing critical reflections by focusing on the problematic relationship between natural sciences and environmental law scholarship. To explore this relationship, it focuses on two key challenges: institutional and epistemological, which confront the growth of an interdisciplinary agenda aimed at bringing natural sciences and environmental law scholarship together.

[1] Elizabeth Fisher et al., 'Maturity and Methodology: Starting a Debate about Environmental Law Scholarship' (2009) 21 *Journal of Environmental Law* 213.

[2] Ole Pedersen, 'Modest Pragmatic Lessons for a Diverse and Incoherent Environmental Law' (2013) 33 *Oxford Journal of Legal Studies* 103; Andreas Philippopoulos-Mihalopoulos & Victoria Brooks (eds.), *Research Methods in Environmental Law: A Handbook* (Cheltenham: Edward Elgar, 2017).

[3] See, for example, Ole Pedersen, 'The Limits of Interdisciplinarity and the Practice of Environmental Law Scholarship' (2014) 26 *Journal of Environmental Law* 423; Dave Owen & Caroline Noblet, 'Interdisciplinary Research and Environmental Law' (2015) 41 *Ecology Law Quarterly* 887.

As a starting point, it should be stated that there is not a unified version of what environmental law is and this of course has repercussions on the way a critique of the discipline and its relationship to natural sciences disciplines can be approached. The meanings of both the 'environment' and 'law' are complex and varied and subject to contestations of a jurisprudential nature. The divide between doctrinal and sociolegal research, which permeates the whole discipline of law, shapes the way in which environmental law scholarship is constructed and the possibilities for interdisciplinary research. This chapter adopts a sociolegal approach to environmental law. There is no agreed definition of sociolegal research,[4] and its strength possibly lies in its 'anarchic heterogeneity".[5] For example, sociolegal studies range from empirical studies of law in action under the legal consciousness umbrella,[6] to studies of legal pluralism,[7] the latter being an attractive and complex concept to study multilayered normative orders and discourses.

Law in action is what legal consciousness scholars have always been concerned with, focusing on the engagements with law by ordinary people, often working-class individuals or people at the margin. Many legal consciousness studies explore experiences and attitudes to power/domination and resistance in ordinary people's experiences of law. Subjective experiences of law recorded by the legal consciousness literature not only bring law in dialogue with society but also help rethinking the boundaries of law itself beyond legal texts. Similarly, at the core of legal pluralism lies an understanding of law as a complex and varied occurrence. Legal pluralists have opened law to embrace different types of legal orders, not necessarily tied to the state machinery. A well-known definition of legal pluralism is the presence in a social field of more than

[4] D. R. Harris, 'The Development of Socio-Legal Studies in the United Kingdom' (1983) 3 *Legal Studies* 315; William Twining, *General Jurisprudence: Understanding Law from a Global Perspective* (Cambridge: Cambridge University Press, 2009)

[5] Roger Cotterrell, 'Subverting Orthodoxy, Making Law Central: A View of Sociolegal Studies' (2002) 29 *Journal of Law and Society* 632, 632.

[6] Patricia Ewick & Susan S. Silbey, *The Common Place of Law. Stories from Everyday Life*. (Chicago: University of Chicago Press, 1998). On environmental law scholarship, see Simon Halliday & Bronwen Morgan, 'I Fought the Law and the Law Won? Legal Consciousness and the Critical Imagination' 66 *Current Legal Problems* 1.

[7] See, for example, Sally Engle Merry, 'Legal Pluralism' (1988) 22 *Law and Society Review* 869; Simon A. Roberts, 'After Government? On Representing Law without the State' (2005) 68 *Modern Law Review* 1; Emmanuel Melissaris, *Ubiquitous Law: Legal Theory and the Space for Legal Pluralism* (Farnham: Ashgate, 2009).

one legal order.[8] According to Griffith, the 'myth' of legal centralism has been an obstacle to developing analyses of tribal law or religious law, as they did not deserve to be called law. Against this Western ethnocentrism, legal pluralism flourished to recover those normative orders left silenced and described their interactions with more formal orders. More recent legal pluralist scholarship, such as the work of the De Sousa Santos, has described more complex power relationships between legal orders showing the hybridisation between legal spheres. For De Sousa Santos, 'legal pluralism is the key concept in a postmodern view of law . . . we live in a time of porous legality or of legal porosity, of multiple networks of legal orders forcing us to constant transitions and trespassing. Our legal life is constituted by an intersection of different legal orders, that is, by interlegality.'[9] Such legal porosity and complexity are not confined to postcolonial societies as they also shape Western contexts and operate at different jurisdictional scales. Adopting a legal pluralist perspective enables environmental law scholarship to explore through empirical studies the multiple meaning of law in social-ecological systems and requires scholars to engage with a variety of legal and other cultures participating in the shaping of environmental regulation.

Despite the many variants of legal consciousness and legal pluralism and the existence of other sociolegal approaches, at its minimum common denominator, it can be argued that sociolegal research, following Wheeler and Thomas,[10] is an academic phenomenon requiring scholars to study the context in which law operates and to engage with sociological, historical, political, cultural, economic or other forces, which force us to rethink legal boundaries. Sociolegal research is therefore inherently interdisciplinary. It is not by chance that sociolegal research in environmental law scholarship is carried out by academic alliances between lawyers, sociologists, political scientists, human geographers and anthropologists, among others.[11] However,

[8] John Griffith, 'What Is Legal Pluralism?' (1986) 24 *Journal of Legal Pluralism and Unofficial Law* 129.

[9] Bonaventura de Sousa Santos, *Toward a New Common Sense: Law, Science and Politics in the Paradigmatic Transition* (London: Butterworths LexisNexis, 2002), p. 437.

[10] Sally Wheeler & P. A. Thomas, *Socio-Legal Studies* (Oxford: Hart Publishing, 2000).

[11] Anne Griffiths, Franz von Benda-Beckmann & Keebet von Benda-Beckmann, *Spatializing Law: An Anthropological Geography of Law in Society* (Farnham: Ashgate, 2009); Margherita Pieraccini & Emma Cardwell, 'Divergent Perceptions of New Marine Protected Areas: Comparing Legal Consciousness in Scilly and Barra, UK' (2015) 119 *Ocean and Coastal Management* 21; L. C. Natarajan et al., 'Navigating the Participatory

the interdisciplinarity of sociolegal studies is very much confined within the social sciences.[12]

What happens when such sociolegal environmental research attempts to move beyond the boundaries of the social sciences and encounters the natural sciences? To what extent can environmental sociolegal scholars research and write with natural scientists? These are the key questions this chapter focuses on. Environmental sociolegal scholarship cannot ignore the natural sciences as the majority of environmental law as a field depends on it or more precisely on scientific constructions of what the environment and its sustainable thresholds are. Environmental law's engagement with natural science is unique compared to other law disciplines and has contributed to the shaping of this area of law as extensively discussed in the environmental legal literature,[13] less, I argue, to the shaping of legal scholarship to date. This is because of various constraints that can be subsumed under two main pillars: the institutional and the epistemological.

Institutionally, I will focus specifically on what has been termed the 'audit culture'[14] in which universities are immersed. A consideration of the United Kingdom Research Excellence Framework (REF) will be provided. There are plenty of academic critiques regarding the rise of the neo-liberal university and providing a critical account of the REF.[15] It is not the intention here to reproduce such critiques. The REF will be explored to the extent to which it facilitates or hinders the possibility for interdisciplinary research between environmental sociolegal scholars and natural scientists. Before moving to the epistemological constraints, I intend to discuss also another type of institutional challenge that

Processes of Renewable Energy Infrastructure Regulation: A "Local Participant Perspective" on the NSIPs Regime in England and Wales' *Energy Policy* (forthcoming).

[12] Notable exceptions exist. For a recent example, see Bettina Lange et al., 'A Framework for a Joint Hydro-Meteorological-Social Analysis of Drought' (2017) 578 *Science of the Total Environment* 297.

[13] See, for example, Dan Tarlock, 'Environmental Law: Ethics or Science?' (1996) 7 *Duke Environmental Law & Policy Forum* 193; Dan Tarlock, 'Who Owns Science?' (2002) 10 *Pennsylvania State Environmental Law Review* 135; John McEldowney & Sharron McEldowney, 'Science and Environmental Law: Collaboration across the Double Helix' (2011) 13 *Environmental Law Review* 169.

[14] Marilyn Strathern (ed.), *Audit Cultures: Anthropological Studies in Accountability, Ethics and the Academy* (Abingdon: Routledge, 2000).

[15] See, for example, Sheila Slaughter & Gary Rhoades, 'The Neo-Liberal University' (2000) 6 *New Labor Forum* 73; Susan Wright & Cris Shore (eds.), *Death of the Public University? Uncertain Futures for Higher Education in the Knowledge Economy* (Berghahn Books, 2017); Stefan Collini, *Speaking of Universities* (Verso, 2017).

concerns early-career researchers. This is the rise of doctoral training centres, which are recent cross-institutional centres to fund doctoral researchers and offer interdisciplinary pathways and cross-council scholarships.

Even in an ideal world in which all institutional constraints are overcome, the collaboration between natural scientists and sociolegal environmental scholars may still be a difficult one due to epistemological differences between science and law. To explore the epistemological boundaries will require a brief excursus into the philosophy of science and the demystification of the positivist paradigm by sociologists of scientific knowledge. Many of the critiques that will be presented here draw on the literature of Science and Technology Studies (STS). Such literature proves useful in both tackling the institutional and epistemological challenges and showing the connections between them. Indeed, STS have critically investigated the rise of entrepreneurialism as the organising principle of academia[16] and the introduction and effects of audit and assessment procedures on researchers' subjectivities, careers and publication practices.[17] At the same time, STS scholars have problematised the notion that scientific knowledge is distinct from other types of knowledge. Although my institutional analysis is based on examples from UK universities, the epistemological challenges that will be discussed are of a wider relevance as they focus on the relationship between environmental law scholarship and other forms of knowledge.

2 Institutional Constraints

2.1 Audit Cultures

> *'[E]very established order tends to produce . . . the naturalization of its own arbitrariness.'*[18]

UK academics are immersed in a pervasive 'audit culture'. *Audit Cultures* is the title of a book edited by the anthropologist Marilyn Strathern in 2000.[19] The book has many contributions from scholars critically

[16] Sheila Slaughter & Larry L. Leslie, *Academic Capitalism: Politics, Policies, and the Entrepreneurial University* (Baltimore, MD: Johns Hopkins University Press, 1998).

[17] For example, Strathern, *Audit Cultures*; Angela Brew & Lisa Lucas, *Academic Research and Researchers* (Society for Research into Higher Education and the Open University Press, 2009).

[18] Paul Bourdieu, *Outline of a Theory of Practice* (Cambridge: Cambridge: University Press, 1977), p. 164.

[19] Strathern, *Audit Cultures*.

reflecting on the auditing practices primarily in their academic environments. As Strathern argues, audits permeating public institutions such as universities are more than practices concerning 'style and presentation' as they become part of 'the general fabric of human interchange';[20] they are a cultural movement becoming a central organising principle of society in particular contexts and creating new auditable individuals participating in rituals of verification.

Building on Power's *The Audit Explosion*,[21] audits are more than just a quantitative neutral technique for improving the accountability and efficiency of an organisation. Audits spread a culture of administrative control and contribute to the making of knowledge and auditees by articulating values and frameworks under which the subjects of audits can move. Audits therefore are active. In the words of Power, 'audit actively constructs the context in which it operates ... audits do not passively monitor auditee performance but shape the standards of this performance in crucial ways.'[22] They construct definitions of quality and performance as much as monitoring them. Self-reflexivity is encouraged by the audits but within fixed parameters and frameworks. Hence audits significantly shape the production of knowledge and scholarship and, I will argue later, in how far environmental sociolegal scholars can push the boundaries of their research. I will make this argument by reference to the quintessential example of auditing in UK universities, the REF.

The REF plays a major role in the allocation of resources and in giving visibility and credibility to the institutions and their individual departments. The REF was first carried out in 2014, replacing the previous Research Assessment Exercise (RAE). The first of such auditing exercises dates back to 1986, the time of Margaret Thatcher's government. It was conceived as a means to decide the allocation of funding at a time of austerity. Several refinements and amendments to the exercise over time relate to what to grade, how to grade and who could participate.[23]

[20] Ibid. p. 4.
[21] Michael Power, *The Audit Explosion* (New York: Demos, 1994).
[22] Ibid. 7.
[23] For a review of the history, please see Kate Williams & Jonathan Grant, 'A Comparative Review of How the Policy and Procedures to Assess Research Impact Evolved in Australia and the UK' (2018) *Research Evaluation* (forthcoming); John Brennan & Sofia Branco Sousa, 'UK Research Excellence Framework and the Transformation of Research Production' in Christine Musselin and Pedro Teixeira (eds.), *Reforming Higher Education. Higher Education Dynamics* (New York: Springer, 2013); Ben Martin, 'The Research Excellence Framework and the "Impact Agenda": Are We Creating a Frankenstein Monster?' (2013) 20 *Research Evaluation* 247.

The key criteria for assessing outputs in the REF 2014 were originality, significance and rigour, and it is expected that they will be used in the REF 2021. Originality referred to the innovative character of the output such as engagement with new/complex problems and developing innovative research methods and methodologies. Significance referred to the development of the intellectual agenda, which may be theoretical, methodological, substantive. Finally, rigour referred to the intellectual precision, robustness and appropriateness of the output.

It is useful to note that in the REF 2014, the scope of research that could be submitted to the law sub-panel was widely constructed comprising 'all doctrinal, theoretical, empirical, comparative, critical, theoretical, historical or other studies of law and legal phenomena including criminology and sociolegal studies'.[24] Saliently, it was stated that research in law might intersect and draw upon a variety of disciplines and methodologies. This encompassing understanding of legal research clearly opened spaces for interdisciplinary research, at least within the social sciences.

Nevertheless, as discussed in the Stern Review in 2016,[25] despite the growing importance of interdisciplinary research, often required by grant calls to address global challenges, the disciplinary 'silos' in the Unit of Assessment panel structure were perceived as discouraging such work. Thus, many departments adopted a risk-adverse strategy by not submitting as many interdisciplinary outputs as available. The Stern Review recommended the placing of more emphasis on and providing more guidance to the panels to recognise interdisciplinary work through the appointment of interdisciplinary 'champions' on the sub-panels with interdisciplinary expertise and to introduce interdisciplinarity also in the environment element of the REF 2021.

To address such calls for further developing interdisciplinary research, an Interdisciplinary Research Advisory Panel (IDAP) has been established to advise the REF team, REF panel chairs and the UK funding bodies on the approach for submitting and assessing interdisciplinary outputs in the new REF 2021. Following the IDAP's advice, the REF 2021 will have in each sub-panel at least one appointed interdisciplinary research adviser to oversee the equitable assessment of interdisciplinary

[24] Part 2C Main Panel C Criteria, REF 2014, 60, www.ref.ac.uk/2014/media/ref/content/pub/panelcriteriaandworkingmethods/01_12_2C.pdf.

[25] Building on Success and Learning from Experience: An Independent Review of the Research Excellence Framework, Department for Business, Energy and Industrial Strategy, July 2016, www.gov.uk/government/uploads/system/uploads/attachment_data/file/541338/ind-16–9-ref-stern-review.pdf.

research. Interdisciplinarity will also figure in the environment template to describe how the submitting unit's structures support interdisciplinary research. Finally, the so-called interdisciplinary identifier will be retained in the submission system as an optional field to better identify interdisciplinary research for which the appointed members will have oversigh.[26]

The inclusion of interdisciplinary research advisers on each sub-panel and of a new interdisciplinarity section in the environment template is a welcome development, which shows the institutional willingness to support interdisciplinary work. The extent to which these will make a difference on the assessment of interdisciplinarity is however unknown. Decisions regarding who will be appointed in the REF sub-panel to oversee interdisciplinarity have not been made at the time of writing and the way in which institutions and departments will complete the interdisciplinary section of the environment template is also unknown.

Whether these developments will minimise the risk-adverse strategy permeating REF 2014 leaves a question mark, especially in relation to outputs bridging natural and social sciences. Indeed, as in the past REF 2014, in the REF 2021 each sup-panel sits within a main panel. Law sits within Panel C (Social Sciences), whilst, for example, life sciences sit under Panel A (Medicine, Health and Life Sciences). In REF 2014, the biological sciences sub-panel admitted outputs that crossed other disciplines within the main panel but did not refer to research crossing other main panels.[27]

Thus, even if REF sup-panels have shown openness towards publications in non-disciplinary journals in the last REF and the definition of legal research as reported earlier is very inclusive and the renewed emphasis on interdisciplinarity for REF 2021 constitutes a positive sign, departments may still be adopting a risk-adverse strategy for outputs crossing natural sciences and social sciences due to lack of explicit connections in the REF definitions of research between the 'macro' subjects. This may also be due to issues such as journal formatting and expectations regarding authorship and length of articles that differ greatly between, in our case, legal research and natural sciences. If co-authorship is contemplated in law and in the REF sub-panel, the majority of outputs of legal scholars are often single authored or have at most a handful of writers. In the natural sciences, long lists of authors appear,

[26] See REF 2021, Interdisciplinary Research at www.ref.ac.uk/about/ir/.

[27] Part 2D Main Panel Criteria, REF 2014, 21, www.ref.ac.uk/2014/media/ref/content/pub/panelcriteriaandworkingmethods/01_12_2A.pdf.

with the first and last occupying the key places and the length of publications tends to be much shorter than in law. Also, formatting of papers is more rigid in the natural sciences, which often require a standardised format with headings such as 'material and methods' and 'results'. Such formatting and length may not work for environmental legal scholarship. All of this implies that even if co-authorship is possible and interdisciplinary research is well regarded in the REF, legal scholars may avoid submitting for the REF outputs that are the product of intellectual exchanges with natural scientists for fear of not being equitably assessed. It may be safer for environmental lawyers to push the disciplinary boundaries nearer home, engaging with other social scientists given that sociolegal research is firmly written into the definition of legal research, as discussed earlier.

2.2 Training Interdisciplinary Scholars

The previous section argued that, cumulatively, a particular auditing culture embodied by the REF, next to different publication styles and perceptions of scholars and schools, constitutes an apparatus that challenges the possibility of interdisciplinary research between the natural and social sciences. This is however at odds with a grant culture that pushes for creative interdisciplinary research across the sciences. The Global Research Council has addressed the growing recognition of funding interdisciplinary research worldwide.[28] At the UK level, Research Councils encourage cross-council collaborations advertising joint calls to address global sustainability challenges.[29] Such collaborations are encouraged at the very early stages of the academic career; indeed, there are instances in which cross-council funding (for example, Natural Environment Research Council/Economic and Social Research Council) is available for PhD students. With the rise of doctoral training partnerships in the country, interdisciplinary pathways are flourishing. Most are internal to either the social or natural sciences, for example,

[28] 'Statement of Principles of Interdisciplinarity', Global Research Council, available at www.rcuk.ac.uk/documents/documents/GRC2016Interdisciplinarity-pdf/.

[29] See, for example, 'The UK Strategy for the Global Challenges Research Fund', Department for Business, Energy and Industrial Strategy, 2017 at www.rcuk.ac.uk/documents/documents/global-challenges-research-fund-gcrf-strategy-pdf/. The Global Challenges Research Fund brings together the UK Research Councils with other funding bodies including UK Higher Education Funding bodies, the Academy of Medical Sciences, Royal Society, British Academy, the Royal Academy of Engineering and UK Space Agency.

requiring students to have proposals bridging law and geography and a supervisory team representing the different disciplines. This is of course positive for environmental sociolegal researchers.

To provide an example within my own institution (University of Bristol), the Economic and Social Research Council South-West Doctoral Training Partnership,[30] which is a collaboration between the universities of Bristol, University of the West of England, Bath, Exeter and Plymouth, hosts among its interdisciplinary pathways one called Sustainable Futures,[31] which attracts, inter alia, law students who are interested in exploring the interface between law and other social sciences disciplines in the field of sustainability. Such cross-institutional and cross-disciplinary perspectives have their institutional challenges: from the funding which is assigned to the school of the first supervisor, to different PhD handbooks in different schools with different reference styles and methodologies and different requirements for tracking students' performance during the course of the PhD programme. These are all elements of the audit culture, challenging the development of interdisciplinary research.

Those challenges are exacerbated when attempts at cross-council studentships are made. Once again, speaking from my own experience, in recent years the Economic and Social Research Council (ESRC), South-West Doctoral Training Partnership has provided matching funding for scholarships with the Natural Environment Research Council Great Western Four+ Doctoral Training Partnership, a partnership designed to train earth and natural scientists in Bath, Bristol, Exeter and Cardiff.[32] The challenges of such cross-council scholarships are more substantial than the challenges mentioned earlier within interdisciplinary pathways such as Sustainable Futures. These begin with different approaches to the development of research proposals: in the natural sciences, students are asked to apply to proposals designed by supervisors in advance and they are assessed on the basis of their fit within that proposal; in the social sciences, students are asked to develop their own proposals and the choice of whom to fund heavily relies on the academic quality and feasibility of the proposal. This implies that when cross-council studentships are advertised, a choice between the social or the natural science

[30] See South West Doctoral Training Partnership, www.swdtp.ac.uk/.

[31] See 'Sustainable Futures', South West Doctoral Training Partnership, www.swdtp.ac.uk/home-page-2/prospectivestudents/pathway-information/sustainable-futures/.

[32] See NERC Great Western Four+ Doctoral Training Partnership, https://nercgw4plus.ac.uk/.

approach needs to be made by the governance bodies of the doctoral training partnerships. Applicants trained in natural sciences may find it difficult to develop their own proposals from scratch, and applicants from the social sciences may find applying to an already existing proposal intellectually constraining. Second, it is difficult to find students who have been trained in both natural and social sciences and therefore capable of excellent performance in both elements of the PhD research: undergraduate and masters degree programmes generally sit within either social or natural sciences.

The example of doctoral training centres shows how the institutional constrains of bridging natural and social sciences explored earlier in the context of the REF examples are also present from the early stages of an academic career. However, if we, as environmental sociolegal scholars, are serious about engaging with the environment, rather than only with rules regarding the environment, it is essential that a radical shift in the organisational structure of universities, beginning from teaching up to research auditing exercises, occurs to facilitate interdisciplinary research encounters. For example, more interdisciplinary teaching programmes at the undergraduate and postgraduate levels could be developed. If this already occurs in certain subjects crossing the human and physical dimensions of knowledge, such as geography, it is much more challenging for law, which is more inward looking, probably also due to its vocational nature, which requires the syllabus to cover subjects for a qualifying law degree. Nevertheless, law school could offer options of joint honours degrees with natural sciences. As for research audits, a more explicit consideration of interdisciplinary research among the macro subjects could be made, as well as the development of clear guidelines regarding its assessment to incentivise such types of outputs.

Provided that the institutional challenges described earlier are overcome with time, there remains another set of key challenges of an epistemological nature, which may render improbable solid interdisciplinary research between sociolegal scholars and natural scientists. The next section explores such epistemological differences and in doing so it asks to what extent these are inherent in the nature of the disciplines or, at least partially, institutionally constructed and reproduced.

3 Epistemological Challenges

Wilhelm Windelband, a neo-Kantian philosopher, made the well-known distinction between different approaches to knowledge and knowing: the

idiographic and the nomothetic. Such division is between those studying values and subjectivities and those concerned with the search for generalisable laws (*nomos*) based on systematic empirical observation of facts. The extent to which this distinction corresponds to that between positivist natural sciences (the nomothetic) and interpretivist social sciences (the idiographic) determines the possibility of interdisciplinary scholarship.

Positivists, arguing that social sciences are also nomothetic, have questioned such a distinction. Notable in this respect is the early positivist position articulated by Comte, followed by the sociology of Durkheim based on the argument that social facts should be treated in the same ways as the objects of scientific inquiry and also the refinements of the neo-positivism of the Vienna School in the 1920s, which attempted to apply the atomistic philosophy of natural sciences to the social sciences and argued more fundamentally that science is the description of experience.

Positivists, as is well known, are proponents of the verifiability of knowledge, its neutral (value-free) character and the experimental method based on observational units. Valid knowledge is produced independently of ethical or subjective elements. From a positivist standpoint, the union between natural and social sciences exists on the basis that all science should be based on the nomothetic approach. Comte's thesis on the unity of science indeed implies that there cannot be a distinction between the natural and social sciences.

However, the core elements of positivism have been criticised since the 1950s, most famously with Popper's argument that science proceeds deductively through the principle of falsification (rather than verification) or with the Kuhnian concept of paradigm and the importance assigned to the historical and social contexts that allow revolutions and new paradigms to emerge.

Positivism has also been strongly rejected by one the one hand, the critical theorists of the Frankfurt School and, on the other, by Science and Technologies Studies (STS). I am focussing here on some of the insights offered by STS because, in critiquing positivism, they, differently from the traditional position of the Frankfurt scholars,[33] question its validity also in the context of the natural sciences. Their critiques are highly

[33] See Barry Barnes, *Interests and the Growth of Knowledge* (Abingdon: Routledge, 1977).

relevant for social-legal environmental law scholarship.[34] In doing so, the STS scholars highlight the societal, historically contextual character of scientific knowledge and offer the opportunity to recover epistemological bridges between the natural and social sciences.

3.1 Beyond Nature and Culture, Beyond Natural Scientists and Environmental Law Scholars?

Following Jasanoff,[35] the STS literature can be divided into two strands: the 'constitutive' and the 'interactional'. The first strand, associated most predominantly with the work of Latour and fellow Actor-Network-Theory scholars,[36] is more concerned with metaphysical questions regarding the boundaries between the natural and the social. The second strand, rooted in the Edinburgh school of sociology of scientific knowledge, focuses on epistemology, more specifically 'knowledge conflicts within worlds that have already been demarcated, for practical purposes, into the natural and the social'.[37]

Of course, the two strands inform each other and produce overlapping critiques. Indeed, in studying science as a social practice, the 'constitutive' STS literature has shown how science establishes itself with a demarcated identity and authority. In *Science and Action*,[38] for example, Latour's argument is that what distinguishes science from other regimes is not its rationality but the way in which science-objects are constructed within particular networks of discourses, materials and practices. These networks in a sense enact the scientific, bringing into being what they discover. The STS literature has demonstrated how the social elements of scientific knowledge and how the boundaries between scientific objects and social values are blurred in real life. The detachment of the research object from the observer (the scientist) is put into question in these studies. To bring another example, Latour and Woolgar's (1986)

[34] It could be argued that they are less useful for doctrinal legal studies, given their legal positivist underpinning.

[35] Sheila Jasanoff, *States of Knowledge: The Co-Production of Science and Social Order* (Abingdon: Routledge 2004).

[36] Bruno Latour, *We Have Never Been Modern* (Cambridge, MA: Harvard University Press, 1993); Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (Chicago: University of Chicago Press 1995).

[37] Jasanoff, *States of Knowledge*, p. 19.

[38] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Cambridge, MA: Harvard University Press, 1987).

classical study of the daily practices of scientists working at a neuroendocrinology laboratory at the Salk Institute of Biological Sciences showed that positivist analyses of rationality, of evidence, of truth were not overly relevant to understanding the production of scientific knowledge.[39]

The 'interactional' approach focuses even more explicitly on knowledge conflicts, and its insights are very relevant for thinking about possible bridges between sociolegal environmental scholarship and the natural sciences. Shapin and Schaffer make the argument that claims to reliability and truth are sustained through techniques of validation, and social practices render scientific knowledges more credible than others, defining science and scientists.[40] The validation of science as a distinguished subject is not independent from the political and the subjective. Similarly, the 'boundary work' of Gieryn shows how particular social, institutional practices and discursive representations help in demarcating the boundaries of science. Carving a special place for scientific disciplines is therefore a 'boundary-work': 'their [scientists] attribution of selected characteristics to the institution of science (i.e., to its practitioners, methods, stock of knowledge, value and work organization) for purposes of constructing a social boundary that distinguishes some intellectual activities as "non-science"'.[41] Its boundaries are always in the making so that scientific epistemologies are flexible, varying historically, geographically and politically.

The STS literature has made a strong case against the boundedness of disciplines, showing that they are not closed and homogenous systems but have porous borders.[42] Relatedly, they have made the argument that epistemological clashes are also present within a particular discipline and therefore disciplines are not necessarily uniform. As Lowe et al. argue, 'what holds most disciplines together is a collective claim to authoritative understanding of certain

[39] Bruno Latour & Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton, NJ: Princeton University Press, 1986).

[40] Steven Shapin & Simon Shaffer, *Leviathan and the Air-Pump* (Princeton, NJ: Princeton University Press, 1985).

[41] Thomas F. Gieryn, 'Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists' (1983) 48 *American Sociological Review* 781, 782.

[42] Andrew Abbott, *Chaos of Disciplines* (Chicago: University of Chicago Press, 2001).

problems or objects and an evolving nexus of institutional connections'.[43]

These observations are relevant in at least two respects. First, they support the dismantling of dichotomies such as the nomothetic vs the idiographic, the facts vs values, the natural sciences vs the social sciences showing how natural science itself has a strong subjective element and is not a-political or a-contextual. Rather than following a positivistic pathway of the unity of science, STS studies rekindle the social and natural sciences by showing their 'co-production', to use Jasenoff terminology.[44] This opens windows of opportunity for collaborative and interdisciplinary research. Second and even more telling, these observations help us reconnect with the institutional challenges discussed earlier in showing that institutions themselves, including academia, are a space for boundary demarcation between the disciplines and the fortification of their epistemological differences. Institutionalised ways of characterising knowledge have an effect on the possibility for interdisciplinary research between environmental law and natural scientists and in doing so they foster the perceptions of unsurmountable epistemological differences. A brief sociological excursus into the history of science shows us that the way we understand valid and rigorous knowledge has been subject to change. Academic institutions play a major role in defining knowledge and its boundaries and in doing so produce the naturalisation of epistemological openings or closures. The epistemological issues cannot therefore be disentangled from the institutional ones.

Conclusion

Environmental law scholarship is caught in a dilemma. On the one hand, as a relatively young discipline, it needs to establish firm borders, 'discipline' itself so as to gain authority by having an agreed set of problems, theories and methods that are perceived to be rigorous. On the other hand, because of the nature of its object (the environment) and because of the spaces in which environmental law is produced (often at the interface between the legal and the political), environmental law scholarship cannot isolate itself, for its very existence depends on science, politics and also culture(s) of legal subjects.

[43] Philip Lowe & Jeremy Phillipson, 'Barriers to Research Collaboration Across Disciplines: Scientific Paradigms and Institutional Practices' (2009) 41 *Environment and Planning A* 1171, 1173.

[44] Jasanoff, *States of Knowledge*.

The question of interdisciplinarity is indeed not an add-on to environmental law scholarship but inherent in the essence of its subject matter. If sociolegal scholarship in environmental law is sufficiently developed, with scholars sitting in law schools borrowing insights from sociological theories, political science, anthropology and human geography, the connections between environmental law scholarship and natural science scholarship is more embryonic. This is not to say that environmental law scholars are not engaging with science and technology: from the very beginning environmental law scholars have studied and questioned the role of science in the production and reproduction of environmental law. However, it is science, rather than scientific disciplines, and environmental law, rather than law scholarship, that are at the core of existing academic analyses. This chapter has put the question of interdisciplinarity between natural sciences and environmental law scholarship at the centre, signposting some of the challenges of pushing the boundaries of environmental law scholarship beyond the social sciences. The discourse of interdisciplinarity is well established in academic circles and research councils, and other funding bodies are making efforts to establish cross-council funding opportunities to tackle complex environmental problems.[45] Following Gibbons et al.[46] and Nowotny et al.,[47] this can be characterised as part of a shift from 'Mode 1' to 'Mode 2' knowledge production, the latter characterised by research aimed at transcending disciplinary boundaries and also academic and non-academic interests.[48]

However, this chapter has argued that there are some key institutional and epistemological challenges that are interrelated and that should be taken seriously, prior to concluding that Mode 2 knowledge production guarantees the possibility for interdisciplinary work between natural scientists and environmental law scholars.

Perhaps what is more realistic at present is to make a case for multidisciplinary rather than interdisciplinary research, so that cooperation happens without attempts at synthesis or integration given the challenges identified. This however accords to what Pedersen has called, a 'service' version of interdisciplinarity, which consists in environmental lawyers

[45] Lowe & Phillipson, 'Barriers to Research Collaboration Across Disciplines'.

[46] Michael Gibbons et al., *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* (Sage, 1994).

[47] Helga Nowotny et al., *Re-Thinking Science. Knowledge and the Public in an Age of Uncertainty* (Polity Press, 2001).

[48] Notable in this respect is the Impact culture in REF, which is assigned even more weight in REF 2021.

contributing 'to a self-contained piece of scholarship or a research project as part of a larger endeavour, counting scholars from different backgrounds amongst its contributors'.[49] A multidisciplinary option is epistemologically less challenging because it does not require scholars to rethink the production of knowledge within their field. A 'service' version however reinforces the production of disciplinary differences. Even if we accept this very soft version of interdisciplinarity, we still run against some of the institutional challenges identified earlier, such as current auditing mechanisms not so ready to assess research that crosses the main REF panels. Indeed, the key message of this chapter is that unless the institutional frameworks are revised to give serious weight to interdisciplinary scholarship, either service versions of interdisciplinarity or more 'interactional' versions are risky endeavours.

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[49] Pedersen, 'The Limits of Interdisciplinarity', 427.

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